Guidebook on integrating community-based adaptation into REDD+ projects: Lessons from Indonesia and the Philippines

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Cover photo by Bruno Locatelli
Coast and mountains in Indonesia.

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Abbreviations

BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)
BMZ	Federal Ministry for Economic Cooperation and Development (Germany)
CBA	Community-based adaptation
CBFMA	Community-based Forest Management Agreement
CIP	Climate Information Portal
CRU	Tyndall Centre's Climate Research Unit
DENR	Department of Environment and Natural Resources (Philippines)
FIDA	Fiber Industry Development Authority
FLUP	Forest land-use plan
GCM	General circulation model
GHG	Greenhouse gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
ID	Indonesia
IPCC	Intergovernmental Panel on Climate Change
NTFP	Non-timber forest products
PH	Philippines
PO	People's Organization
RCM	Regional circulation model
REDD+	Reduced emissions from deforestation and forest degradation
SROI	Social return on investment

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Part 1: Concepts and tools

Introduction

Efforts to tackle climate change are often divided into mitigation approaches and adaptation approaches. Given that mitigation is usually a global priority and adaptation a local priority, practitioners and planners may find it difficult to bridge the scales and ensure that mitigation projects address adaptation concerns and vice versa.

This guidebook demonstrates how community-based adaptation (CBA) can be integrated into mitigation activities, such as reduced emissions from deforestation and forest degradation (REDD+) projects, by incorporating such methods as vulnerability analysis, participatory research and cost–benefit analysis. The use of multiple methods makes it possible not only to link scales but also to integrate adaptation priorities into REDD+ projects.

Part 1 of this guidebook reviews the central concepts in addressing climate change, such as mitigation and adaptation, as well as concepts in the social return on investment (SROI) framework. SROI comprises a combination of methods that includes participatory research, visioning and cost–benefit analysis.

In Part 2, the guidebook sets out a five-step approach to integrating CBA into REDD+ projects (Figure 1). The first step is to conduct a vulnerability analysis.

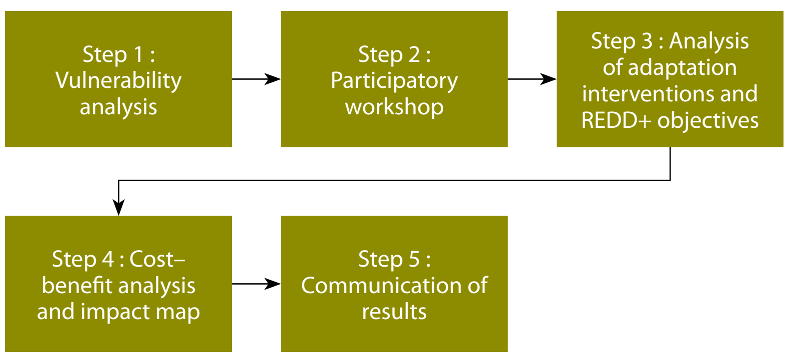

Figure 1. Five steps to integrate community-based adaptation into REDD+.

In the second step, which is part of SROI, participatory research is conducted, using workshops to gather and analyze information from multiple stakeholders and visioning exercises. Step 3 is to discuss adaptation interventions and REDD+ objectives to assess how to merge CBA into REDD+ projects. Step 4 involves conducting a cost–benefit analysis and developing an impact map, which are also part of the SROI framework. In Step 5, the results of the first four steps are communicated to those who participated and other involved stakeholders.

This guidebook is intended for development, conservation and climate change planners and practitioners who have some experience in conducting research and/or implementing projects at the community level using community-based frameworks, participatory research methods and cost–benefit analysis. The aim of the guidebook is to enable users to better integrate adaptation and mitigation activities.

Examples from Indonesia and the Philippines are included to demonstrate how the steps set out in this guidebook were followed. In Indonesia, activities took place in the community forest (*hutan desa*) REDD+ project area in Setulang Village, Malinau District. This project was implemented by the FORCLIME program of GIZ and funded by the German Federal Ministry for Economic Cooperation and Development (BMZ). In the Philippines, the municipality of Sogod was selected for the case studies. Sogod is one of five target municipalities in Southern Leyte Province for the project *Climate-relevant Modernization of the National Forest Policy and Piloting of REDD Measures in the Philippines*. The project is being carried out by GIZ in collaboration with the Philippine Department of Environment and Natural Resources (DENR) and local government units, with funding from the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) under the International Climate Initiative. Activities in the case study areas and the production of this guidebook were made possible by financial contributions from BMZ and the collaboration of GIZ teams in Germany, Indonesia and the Philippines.

Forests and climate change: Merging adaptation and mitigation

(a) Adaptation and mitigation: Two strategies for dealing with climate change

Forests play an important role in both adaptation and mitigation.
Adaptation is an 'adjustment' in natural and human systems in response to climatic stimuli. **Forests contribute to the adaptation of people and economic**

sectors by providing ecosystem services that reduce vulnerability. Examples of such services include the provision of goods that act as safety nets when crops fail because of drought (e.g. non-timber forest products (NTFPs) and fuelwood to supplement nutrition and income) and the regulation of water flows and sedimentation during heavy rainfall events.

Mitigation is an intervention that reduces greenhouse gas (GHG) emissions or enhances carbon sinks (IPCC 2001). Forests contribute to mitigation through their capacity to remove carbon from the atmosphere and to store it. REDD+ is a mitigation strategy aimed at achieving the conservation and sustainable management of forests and/or the enhancement of forest carbon stocks. Adaptation and mitigation strategies differ in their objectives and spatial and temporal scales (Table 1).

Table 1. Differences between mitigation and adaptation

	Mitigation	Adaptation
Spatial scale	Primarily an international issue, as mitigation provides global benefits	Primarily a local issue, as adaptation mostly provides benefits at the local scale
Time scale	Mitigation has a long-term effect because of the inertia of the climatic system	Adaptation can have a short-term effect on the reduction of vulnerability
Sectors	Mitigation is a priority in the energy, transportation, industry and waste management sectors	Adaptation is a priority in the water and health sectors and in coastal or low-lying areas
	Both mitigation and adaptation are relevant to the agriculture and forestry sectors	

Source: Locatelli (2011).

(b) Linking adaptation and mitigation through forests

REDD+ interventions can contribute to the adaptation of both people and forests by conserving or enhancing biodiversity and forest ecosystem services (e.g. through the reduction of anthropogenic pressures such as deforestation and forest degradation). However, additional adaptation measures might be needed, such as the protection of agriculture and livelihoods or the development of fire management strategies. Such measures can support the sustainability of REDD+ interventions and the permanence of carbon stocks by preventing activity displacement and induced deforestation, and by limiting or avoiding damage to the ecosystem from extreme weather events. Integrating adaptation into a REDD+ project can also increase the local legitimacy of the project because adaptation focuses on local needs. In turn, adaptation projects can benefit from carbon funding and capacity building from international mechanisms, such as REDD+, as well as from being linked to mitigation with its global benefits. This link opens up possibilities to bridge the scales between climate change activities. Adopting an integrated approach to climate change by maximizing the synergies between adaptation and mitigation and by minimizing any potential trade-offs can be not only very cost effective but also highly beneficial for ecosystems and people.

Drawing on the principles of SROI, a multistakeholder approach is adopted to analyze the potential impacts of implementing selected CBA interventions within REDD+ case study areas. Special emphasis is placed on forest resources and forest management to examine the potential costs and benefits of adaptation interventions for effective REDD+ implementation.

Further reading and resources

Locatelli B. 2011. *Synergies between Adaptation and Mitigation in a Nutshell*. Bogor, Indonesia: Center for International Forestry Research. http://www.cifor.org/fileadmin/fileupload/cobam/ENGLISH-Definitions%26ConceptualFramework.pdf

Pramova E, Locatelli B, Djoudi H and Somorin OA. 2012. Forests and trees for social adaptation to climate variability and change. Wiley Interdisciplinary Reviews: *Climate Change* 3(6):581–96. http://www.cifor.org/online-library/browse/view-publication/publication/3938.html

Graham K. 2011. REDD+ and Adaptation: *Will REDD+ Contribute to Adaptive Capacity at the Local Level?* London: Overseas Development Institute. http://www.odi.org.uk/publications/6147-redd-adaptation-local-adaptive-capacity

Social return on investment: Methodology and key concepts

Social return on investment (SROI), pioneered by The Roberts Enterprise Development Fund in early 2000, is a framework for stakeholder participation in the valuation of the social, environmental and economic outcomes (both positive and negative) of an intervention (Sova et al. 2012). In contrast to traditional cost–benefit analysis, SROI analyzes change in a way that is relevant to the people or organizations that experience or contribute to it. The framework is inspired by the principles of economic cost–benefit analysis, impact assessment and social accounting, which seek to understand and manage the value created by an activity or an organization in a holistic manner. Sova et al. (2012) enhances the SROI framework and its applicability to adaptation planning and costing by adding core principles and practical components from CBA, participatory rural appraisal and strength-based approaches to development, allowing for communities, through participatory workshops, to design their own adaptation interventions based on their values and capacities.

Although the SROI framework combines various methods for assessing social, environmental and economic values, it is based on theory of change. Theory of change takes into account the chain of events and outcomes connected to a specific intervention. It identifies where and how value is being created and by whom, and who benefits from it and how, across time and space.

The SROI process draws on the principles and methods mentioned above to review components of theory of change, such as the inputs, outputs, outcomes and impact of an intervention or organization through an impact map. Wherever possible, outcomes are given a monetary value to conduct the economic cost–benefit analysis within the impact map, using prevailing market prices for traded goods and financial proxies for intangible and nonmarketable outcomes (e.g. more free time for women).

An SROI analysis can be evaluative, that is, conducted retrospectively and based on actual outcomes that have already taken place. It can also be used to forecast and predict the likely impact and social value created if given activities achieve their intended outcomes. Forecast SROI analyses are especially useful when planning an activity because they can help show how investment can maximize impact, the barriers that need to be overcome, and what should be monitored and evaluated once the project or program is up and running. Forecast SROI is the focus of this guidebook.

Further reading and resources

Nicholls J, Lawlor E, Neitzert E and Goodspeed T. 2012. *A Guide to Social Return on Investment.* Haddington, UK: The SROI Network. http://www.thesroinetwork.org/sroi-analysis/the-sroi-guide

Sova C, Chaudhury A, Helfgott A and Corner-Dolloff C. 2012. *Community-Based Adaptation Costing: An Integrated Framework for the Participatory Costing of Community-Based Adaptations to Climate Change in Agriculture*. Working Paper No. 16. Cali, Colombia: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). http://ccafs.cgiar.org/sites/default/files/assets/docs/ccafs-wp-16-psroi.pdf

Part 2 : Application of methods to integrate adaptation into REDD+ projects

Step 1: Vulnerability analysis

A desktop vulnerability analysis is important for gathering existing data and background information, and it contributes to a baseline of vulnerabilities. The desktop climate and vulnerability analysis can cover the entire district or province in which the REDD+ project is being conducted. It can be guided by the vulnerability framework, where vulnerability is considered as a function of exposure, sensitivity and adaptive capacity (Figure 2). This type of analysis should be viewed as 'preliminary', as stakeholder consultations at both community and broader levels will be needed to validate and supplement findings. Attempts should be made to discuss and verify findings of the desktop vulnerability analysis with stakeholders in the participatory activities (Step 2) to make sure the analysis is as robust as possible.

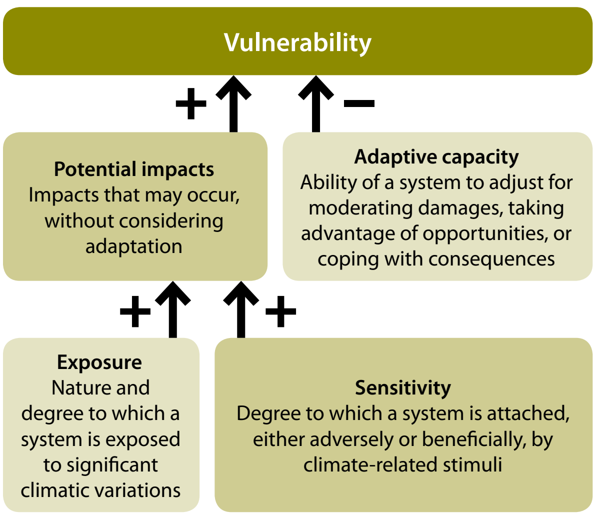

Figure 2. Vulnerability framework. From Locatelli (2011).

(a) Analyzing exposure

Different types of exposure to climate hazards can occur along different temporal scales. Exposure can relate to the frequency and intensity of abnormal or extreme events (e.g. stronger and more frequent storms), the frequency and intensity of climate variability (e.g. alterations in wet and dry months or years, fluctuations in daily minimum and maximum temperatures), the shifting of seasonality in time and space (e.g. long rainy periods in the dry season) or long-term incremental trends and slow-onset changes (e.g. increase of 1 °C in the annual mean temperature by 2050).

Looking at past data

It is important to analyze both past and current climate data, as well as future projections. Past data from meteorological stations can reveal important trends that are occurring now, which are likely to become more intense in the future as climate change progresses. Useful data for analysis include the observed monthly rainfall and temperature and monthly means of daily maximum and minimum temperatures throughout the years, all of which provide valuable information about the seasonal cycles in a location and any changes that might be occurring.

Observed station records are a critical component for this analysis. However, in many parts of the world, observed data dating back more than 10 years are lacking, and data that are available are not always of good quality. The Climate Information Portal (CIP) of the Climate Systems Analysis Group in the University of Cape Town encompasses observational climate data from meteorological stations in Africa and Asia. These data can be easily accessed by all interested users through a simple web interface (see list of tools and resources at the end of this section), which also includes guidance on how to interpret and analyze monthly climate data. The data presented in CIP are quality controlled and only stations with more than 10 years of valid records are included.

If no stations in the proximity of the target location for analysis have good climate records, other solutions must be sought. In the case study area of Sogod, for example, the closest stations are in Tacloban and Maasin city, which are not in the proximity of the municipality and do not present similar geographic or climatological characteristics (see yellow and red dots on the map in Figure 3). For this reason, for both Sogod and Malinau, interpolated datasets were used. Interpolated datasets use measurements from numerous weather stations around the world and apply tested algorithms to infer climatic data for any point in a global grid. For the two case study sites, the WorldClim dataset (Hijmans et al. 2005; www.worldclim.org) was used to look at the mean climate, and the datasets of Tyndall Centre's Climate Research Unit (CRU; Mitchell and Jones 2005; www.cru.uea.ac.uk) were used for the analysis of past annual data and climate trends.

WorldClim constitutes a set of global climate layers (climate grids) with a spatial resolution of about 1 km. Interpolations of observed data are representative of the years 1950–2000. The CRU datasets include month-by-month variations in climate at a resolution of 0.5 arc-degree (around 50 km), based on climate archives from more than 4000 weather stations around the globe.

Figure 3. Climate stations close to Sogod (PH).

Source: Climate Information Portal (http://cip.csag.uct.ac.za/webclient/map).

Future projections

Projections of future climate result from global emission scenarios and general or regional circulation models (GCMs or RCMs; also known as global or regional climate models).The emission scenarios are used as the basis for simulations of the circulation models. They constitute narrative storylines for humankind's development over the next 100 years, including the associated evolution in the volume of GHG emissions. A description of the emission scenarios is given in the Intergovernmental Panel on Climate Change's Special Report on Emission Scenarios (IPCC 2000).

GCMs or climate models are mathematical representations of the climate system, with simulations of the physical and dynamic processes that determine the global climate. These computer models divide the Earth into horizontal and vertical grid cells, where each cell represents a specific climatic state for a specific time based on a set of equations. Given the considerable degree of uncertainty associated with climate models and future emission scenarios, one has to assume that the entire set of model outputs represents equally likely future climates. Consequently, it is recommended that multiple models and scenarios be used to project future climate envelopes. Envelopes of temperature projections for the future will be typically much narrower than the equivalent rainfall envelopes because the uncertainty with precipitation is greater.

Combining the results of the various models and looking at the means or averages is, however, not recommended. Rather, a better approach is to consider all possibilities or a few contrasting scenarios. Close attention should be paid to how climate scenarios agree or disagree. In Sogod, for example, most scenarios indicate that precipitation is likely to increase in July and September, whereas an increase or a decrease is possible for the other months (Figure 4).

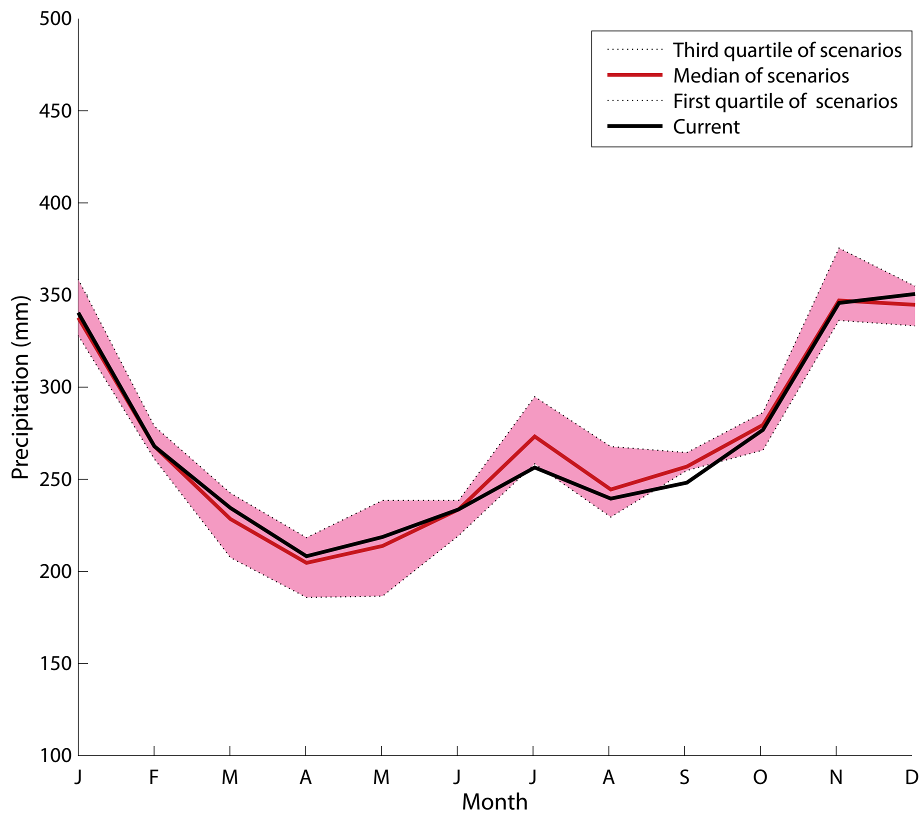

Figure 4. Predicted monthly precipitation in Sogod (PH) for 2080.

Source: TYN SC 2.0 9, Mitchell et al. (2004).

For the case study areas of Malinau and Sogod, future climate trends were retrieved from the TYN SC 2.0 dataset of CRU. The TYN SC 2.0 dataset comprises monthly grids of modeled climate including cloud cover, diurnal temperature range, precipitation, temperature and vapor pressure for the period 2001–2100, and covering the global land surface at 0.5 degree resolution (50 km^2). The outputs of four GCMs combined with four emission scenarios were used (total of 16 projections). The four emission scenarios are A1FI (integrated world characterized by rapid economic growth and high use of fossil fuels), A2 (more divided world, regionally oriented economic development), B1 (world more integrated and more ecologically friendly) and B2 (world more divided and more ecologically friendly). The four GCMs are CGCM2, CSIRO mk 2 (CSIRO2), DOE PCM (PCM) and HadCM3 (HAD3). Data were retrieved for the years 2020, 2050 and 2080. Relevant secondary data from the literature were also used to supplement findings from the model projections.

Regional projections are of higher resolution than global models. Local climates are influenced by smaller-scale features and processes, such as topography, which are not represented well in global climate models.

There are two main types of regional climate projections depending on the downscaling methods used: statistical and dynamic. Statistically downscaled regional projections analyze empirical data from weather stations and extrapolate the results into the future by using climatic trends taken from the GCMs. The CIP platform uses statistical downscaling for areas where observational data are available. The main drawback of statistical downscaling is that empirical climate data are often not available for long periods without gaps because of a lack of observational coverage in many parts of the world.

By contrast, dynamic regional models work in a similar way to GCMs. They are nested into coarser GCMs and use the outputs of the global models to calculate the potential evolution of the climate in a particular area. However, these models require additional computational effort, as the simulation takes longer because additional processes are represented in more detail. Furthermore, they can be as prone to bias and error as GCMs. User-friendly software for generating high-resolution regional models is PRECIS (www.metoffice.gov.uk/precis/intro).

Finally, it must be noted that no matter how advanced a computer model is, uncertainties will always remain when forecasting the carbon cycle and the sources and sinks of GHGs. In addition, current understanding of the very complex feedback processes in the climate system is incomplete (e.g. forests in neighboring regions can influence precipitation in another region of concern). Furthermore, gridded scenarios provide only an average change in climate for each grid box,

Box 1. Current climate trends and future concerns in Malinau (ID) and Sogod (PH)

	Malinau	Sogod
Current trends	Mean climate has low seasonality with mean monthly temperature of 26.4 °C–27.3 °C and precipitation of 205–360 mm/month. Two rainfall peaks occur (around November and May). Temperature: Normal interannual variability but significant warming trend during the past 50 years (increase of 0.2 °C per decade). Precipitation: Interannual variability is relatively normal. Drier and wetter years have occurred but these deviations cannot be considered exceptional. The 5 years with the lowest precipitation are: 1964, 1965, 1967, 1992 and 1997. Those with the highest precipitation are: 1962, 1974, 1980, 1988 and 1999. There is a notable, but not significant, trend of increasing precipitation.	Mean climate has low seasonality with monthly temperature of 23.6 °C–25.4 °C and precipitation of 147–351 mm/month. There is no dry season. The maximum rainfall occurs from November to January. Temperature: Low interannual variability but significant warming trend during the past 50 years (increase of 0.13 °C per decade). Increase in the number of hot days and decrease in the number of cool days. Precipitation: High interannual variability with significant trend of increasing annual precipitation (despite the occurrence of exceptionally dry years). Increase in the frequency of extreme daily rainfall.
Future projections	Temperature: All models show increase: from 0.45 °C (min.) to 0.87 °C (max.) by 2020; 0.76 °C to 2.08 °C by 2050; and 1.03 °C to 3.77 °C by 2080. Precipitation: Half of the scenarios show an increase and half a decrease. For 2020, the maximum increase projected is 38.18 mm/year and the maximum decrease is –62.80 mm/year. For 2050, the maximum increase is 83.19 mm/year, and decrease –154.76 mm/year. For 2080, the maximum increase is 152.00 mm/year, and decrease is –280.83 mm/year. Concerns mostly arise with extremely wet or dry years (interannual variability) and extreme events such as typhoons, heat waves and heavy rainfall events, none of which is simulated well by climate models.	Temperature: All models show increase: from 0.42 °C (min.) to 0.85 °C (max.) by 2020; 0.71 °C to 2.02 °C by 2050; and 0.96 °C to 3.66 °C by 2080. Medium-range emission scenario shows increases in the number of hot days (max. temperature >35 °C) by 2020 and further increases by 2050. Precipitation: High uncertainty. Four scenarios show an increase of >200 mm by 2080, two show a decrease of >200 mm, and 10 show little change. The highest decrease projected is 370 mm less rain by 2080, and the highest increase is 330 mm. Most models show an increase in precipitation from mid-June to mid-September. Concerns mostly arise with extremely wet or dry years (interannual variability) and extreme events such as typhoons, heat waves and heavy rainfall events, none of which is simulated well by climate models.

Sources: Pramova et al. (2013a, 2013b)

Tools and resources

Kropp J and Scholze M. 2009. *Climate Change Information for Effective Adaptation: A Practitioner's Manual*. Eschborn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. http://www.giz.de/Themen/en/28938.htm

Climate Information Portal (CIP) by the Climate Systems Analysis Group, University of Cape Town, http://cip.csag.uct.ac.za/webclient/introduction. CIP maintains an extensive database encompassing observational climate data from Africa and Asia, as well as projections of future climate for all regions of the globe. All data are accessible through a user-friendly web interface.

WorldClim – Global Climate Data. http://www.worldclim.org/

Climatic Research Unit (CRU), University of East Anglia and Tyndall Centre for Climate Change Research. http://www.cru.uea.ac.uk/data; http://badc.nerc.ac.uk/view/badc.nerc.ac.uk__ATOM__dataent_12562237733328276

PRECIS Regional Climate Modelling Software. Based on the Hadley Centre's regional climate modeling system, it runs on a PC (under Linux) with a simple user interface, so that experiments can easily be set up over any region. http://www.metoffice.gov.uk/precis/intro

whereas climates can vary considerably in different parts of the area covered by the grid, and throughout any given decade.

(b) Sensitivity

The degree of sensitivity indicates how responsive a system is to certain climate variables or extremes: more sensitive systems will show larger changes in response to disturbance events. The sensitivity of key resources and sectors in the target area (e.g. specific crops and ecosystems, production systems, health, settlements) can be assessed by conducting a literature review and/or key informant interviews. In REDD+ project areas, forests are a key ecosystem for sensitivity analysis. A sensitivity analysis can also be performed for single species or resources of importance such as fish, rice, maize or water. Key questions include the following:

1. What are the temperature ranges for optimal productivity of the resources species?
2. What is the required water input distributed in time and space for optimal productivity?
3. Beyond which temperature and water thresholds does the system become unproductive? When does the system reach a tipping point?
4. How well can the system tolerate and recuperate from climate extremes such as drought and heavy precipitation? What happens under repeated extreme events?

5. What other factors influence tolerance levels and sensitivity? What nonclimatic disturbances render the system/resource more sensitive?

These questions can be modified to examine the sensitivity of disease vectors and bacteria (e.g. malaria mosquitoes), the sensitivity of settlements to heavy precipitation (e.g. thresholds beyond which flood and disaster risks are augmented) and other issues that are of importance in a particular area. A sensitivity analysis can also be conducted for entire livelihood portfolios (e.g. livelihood sensitivity matrix). For certain resources or ecosystems, additional climate parameters such as relative humidity and solar radiation might be important (e.g. coconut production and its dependence on the number of hours of sunshine).

Sensitivity of key resources may be discussed during stakeholder consultations. It might be necessary to revisit this step after the consultations to explore the sensitivity of any other key resources or ecosystems that the stakeholders mention.

Box 2. Sensitivity in Sogod (PH)

Livelihoods in the upland *barangays*[1] of Sogod largely depend on the production of coconut, abaca, rice, root crops and vegetables and on forest resources. Both agricultural production and forests are sensitive to variability in climate, extremes and longer-term climate change. Rice is very sensitive to high temperatures, especially at critical development stages, and to both increases and decreases in precipitation. Abaca (*Musa textilis*) and banana need abundant rainfall with production decreasing at temperatures above 27 °C, whereas cassava thrives in drought conditions and at 32 °C. Sweet potato is drought resistant but cannot tolerate waterlogging. Coconut cannot tolerate prolonged cloud cover. Tropical rainforests are prone to drought-related mortality and fires during El Niño events.

The degree of sensitivity is influenced by other destabilizing pressures and feedback loops. For example, forests are more sensitive to drought events and fires if they are degraded or logged. Crops are more sensitive to increases in temperature, precipitation, drought and pest outbreaks if they are produced through monocultures and in degraded soils, rather than in more complex systems or agroforestry. Poor sanitation, pollution, and riverbank and watershed degradation increase the severity of flooding events and the proliferation of bacteria and vectors during heavy precipitation. Enhanced and sustainable environmental management can decrease sensitivity, and ultimately impacts, in almost all sectors and systems.

[1] A *barangay* is the lowest administrative level in the Philippines, comparable to villages in other countries.

Source: Pramova et al. (2013b).

Tools and resources

weADAPT: Developing a livelihood sensitivity matrix. http://weadapt.org/knowledge-base/vulnerability/appendix-a-developing-a-livelihood-sensitivity-matrix

CRiSTAL Community-based Risk Screening Tool – Adaptation and Livelihoods: CRiSTAL is a desktop tool for Windows that assesses the impacts of a project on local determinants of vulnerability and exposure so that it can better foster climate adaptation. It can be used for exploring the sensitivity of key livelihood resources. Under development is a new version of the tool – CRiSTAL Forests – that will address specific issues that are relevant for forest ecosystems and forest-dependent communities, including REDD+. http://www.iisd.org/cristaltool/download.aspx

Climate Change Sensitivity Database: This digital database summarizes inherent climate sensitivities for species and habitats of concern throughout the Pacific Northwest. Although the species and ecosystems included might not be relevant for tropical and subtropical countries, the database can provide useful guidance on important factors to consider when analyzing sensitivity. http://climatechangesensitivity.org/

Climate Impacts: Global and Regional Adaptation Support Platform (ci:grasp): Ci:grasp is a web-based climate information service structured around impact chains, which demonstrate how a given climate stimulus propagates through a system of interest via the direct and indirect impacts it entails. http://cigrasp.pik-potsdam.de/

(c) Adaptive capacity

Adaptive capacity is generally associated with the robustness of a socioecological system to disturbance, and its capacity to adapt to actual or anticipated changes, whether exogenous or endogenous (Plummer and Armitage 2010). The adaptive capacity of social systems is determined by the suite of available resources and the social processes and structures through which they are employed and mediated. One of the most important factors shaping the adaptive capacity of individuals, households and communities is their access to and control over natural, human, social, physical and financial resources.

A preliminary analysis of adaptive capacity can be conducted through a literature review and assessment of relevant statistics (e.g. number of health centers in a particular area, number of people with primary and secondary education, etc.). This analysis can only be preliminary at this stage because it needs to be complemented by information from stakeholder consultations.

Resources affecting adaptive capacity include:

- irrigation infrastructure and weather stations (physical)

- community savings groups, farmer organizations and social networks (social)
- reliable freshwater sources and productive land (natural)
- micro-insurance and diversified income sources (financial)
- knowledge, skills and education (human).

For example, farmers who have access to water for irrigation have greater adaptive capacity than farmers who depend solely on rain, because the former group's cropping systems are more robust to decreases in precipitation (provided the irrigation water sources are reliable). Similarly, communities with access to forest and tree resources might be able to adapt better to climate extremes than those without, because, for example, they can use NTFPs for supplementary nutrition and income all year round if crop harvests are smaller than expected (again, provided that the forest resources are managed sustainably).

Adaptive capacity can sometimes be the most difficult component of vulnerability to assess because the presence of resources does not necessarily translate into greater adaptive capacity. This is especially the case if access to resources is restricted or if special knowledge, tools or market or social networks are needed to transform resources into welfare-bearing goods. Stakeholder consultations are therefore an essential step in gaining a holistic understanding of adaptive capacity. In the context of REDD+, understanding current and future access to and uses of forest goods and services under different scenarios is crucial.

(d) Concluding remarks on vulnerability analysis

Adaptation actions are usually planned to address one or several elements of this framework. They may aim to minimize underlying causes of vulnerability (e.g. by ensuring access to resources and healthcare) or to modify exposure to, and the effects of, a specific climate hazard (e.g. building barriers to protect settlements against coastal storms). They can be either incremental or transformational. Incremental adaptations are extensions of existing actions and behaviors to reduce vulnerability, whereas transformational actions are those that are adopted at a much larger scale or intensity and/or are truly new to a particular region or system (Kates et al. 2012). However, climate hazards and their impacts rarely occur in isolation. Systems are usually under pressure from a multitude of interacting stressors, resulting in compound impacts and feedback loops of vulnerability.

Step 2: Participatory workshops

Any institutionally led adaptation strategy will need to include community-based measures to increase the sustainability of adaptation into the future. Research findings suggest that top-down measures may not lead to local resilience in

Box 3. Adaptive capacity in Sogod (PH)

In the upland *barangays* of Sogod, natural resources are available but people do not have secure access to them. People use forest resources to cope with disturbances (e.g. selling rattan products to supplement their income) but they have no proactive resource management strategies for enhanced adaptation over time. They have little diversification of activities within and outside of agriculture, as evidenced by the socioeconomic baseline study for piloting REDD+ activities in Southern Leyte. Furthermore, the area has little in the way of agricultural infrastructure, such as grain storage or irrigation facilities, and no weather stations are in the proximity of Sogod, but these features could help prevent crop failure, income loss and food insecurity. Future yield losses and crop failure could also lead to heavier exploitation of vulnerable forest resources that lack management.

Although intercropping of abaca and other crops with fruit and timber trees can be beneficial in terms of both decreased system sensitivity and economic diversification, agroforestry systems are not widespread. Mono cropping is the dominant system in the farm parcels of Sogod, as in Southern Leyte more broadly. Farmers' reluctance to plant trees outside of their occasional participation in government reforestation programs may be attributed, at least in part, to the insecurity of their tenure over the land. Other reasons inhibiting farmers from planting trees include general unavailability of land, their need for immediate income streams rather than the longer-term returns from planting trees, and the perception that trees are detrimental to coconut production because of shading and nutrient competition.

Most *barangays* also lack social organizations. Of the seven *barangays* that participated in the community workshop, only two have a People's Organization (San Vicente and Kauswagan), and only one (Benit) has a microfinance institution in the vicinity. Similarly, almost all of the respondents to the REDD+ socioeconomic study reported that they are not aware of the existence of any credit and/or related financial services in the *barangays*, noting that only high-interest, informal sources of credit are available.

Source: Pramova et al. (2013b).

Tools and resources

Graham K. 2011. *REDD+ and Adaptation: Will REDD+ Contribute to Adaptive Capacity at the Local Level?* London: Overseas Development Institute. http://www.odi.org.uk/publications/6147-redd-adaptation-local-adaptive-capacity

Jones L, Ludi E and Levine S. 2010. *Towards a Characterisation of Adaptive Capacity: A Framework for Analyzing Adaptive Capacity at the Local Level.* London: Overseas Development Institute. http://www.odi.org.uk/resources/docs/6353.pdf

Sustainable Livelihoods Framework. A framework to examine livelihood assets and capital (human, natural, financial, social, physical), livelihood strategies and outcomes, and the associated structures and processes that increase or decrease vulnerability. It was developed by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (among others). http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf

CRiSTAL: (see previous box) Can also be useful to explore and analyze adaptive capacity.

the long term; on the other hand, bottom-up measures require some form of support from the top to maximize their effectiveness (Amaru and Chhetri 2013). Multilevel stakeholder consultations are an essential first step in this direction. For the two case studies, the following steps were taken to establish stakeholder groups and participatory workshops. It must be remembered, however, that there is no uniform approach to stakeholder engagement and activities may be tailored to the particular situation and culture.

(a) Identifying stakeholders and organizing the workshop

To capture community values and priorities and to understand environmental challenges, a necessary first step is to define the goals of workshop activities and determine which stakeholder groups will participate in the workshops. The outcomes of this step will depend on the resources, timeframe and availability of data. The goals of a study using SROI methodology may differ according to the context, the status of REDD+ activities, the awareness of the stakeholders and the available data.

An initial list of potential workshop participants can be developed by contacting a member of the REDD+ project team, as many REDD+ projects have already identified their stakeholder groups. Although participants should be chosen randomly, especially in large REDD+ projects, it is important to ensure that the workshops involve members of socially differentiated groups within the community, including any marginalized groups, to acquire a wide range of perspectives. Equal gender representation is essential (see CCAFS and FAO (2012) for examples of random sampling strategies for including gender differentiated groups), but it is worth also considering economic status, ethnicity, age, education, geographic distribution, profession and any other locally important differentiations. Other factors, such as location, may also affect the selection of participants (see Box 4). For instance, in Sogod, participants were chosen because of their proximity to the forest and heavy dependence on forest resources. When setting up participatory workshops, a conscious effort should be made to include people who are not participating in REDD+ projects, to capture their valuable perspectives too (see Step 3).

A list of participants cannot be completed or finalized at the beginning of the analysis. Some stakeholder groups, especially at a broader scale, might need to be added or removed after the adaptation interventions are defined depending on whether they are influencing intervention outcomes or are affected by them. It should be noted that the exclusion or inclusion of certain stakeholders in the analysis will affect the overall effectiveness of the adaptation initiative during implementation.

Community consultations can be conducted through a 2- or 3-day participatory workshop with up to 40–50 participants. Ideally, community-level consultations should be conducted in all villages that are expected to be affected by REDD+ project activities. Grouping several communities that are close to each other is also an option if they have similar characteristics.

The main objectives of the workshop are:

- to determine the resource base and available assets
- to identify the underlying causes of vulnerability
- to understand how climate challenges fit within the broader challenges faced by the community
- to incorporate community values and priorities into the selection, planning and evaluation of adaptation interventions.

Particular focus is given to forest and tree resources and their role in coping and adaptation strategies. Activities include a combination of large group exercises and breakout groups. Breakout groups can be mixed, but can also be formed based on gender and other social differentiations if necessary and appropriate for a particular context. Even if workshops have fewer participants (e.g. 20–30), it is recommended that at least two facilitators be available to help guide the breakout groups.

(b) Exploring values, assets and challenges

Six main activities were conducted during the community workshops for the two case studies (listed in Box 5). Activities can be modified or added, according to the context.

Box 4. Selecting workshop participants in Malinau (ID) and Sogod (PH)

REDD+ activities may target a small number of forest-dependent communities (as with Setulang Village in Malinau District, Kalimantan, Indonesia) or they may encompass several municipalities (as with the activities in Southern Leyte Province, the Philippines).

In the case of Malinau, defining the boundaries for local-level consultations was straightforward because, at the time of the case studies, most community-level REDD+ activities were focusing on Setulang.

In the case of Southern Leyte, a specific area of focus had to be selected because of the limited time and resources available to conduct the community workshops and the vast size of the total REDD+ pilot area (more than 40,000 hectares over five municipalities). The catchment area for community consultations was therefore narrowed down to one municipality – the municipality of Sogod – and more specifically to the upland areas. The community workshop was conducted with representatives from seven upland *barangays*. One reason for selecting Sogod was that no climate change adaptation studies had previously been conducted in the municipality.

A range of participatory research methods for assessing vulnerability are available. One very effective tool is participatory mapping (Figure 5). Community mapping can also be used to identify hazards and challenges. Alternatively, during breakout groups, participants can discuss assets/values and challenges, jotting them on Post-It notes to be clustered in groups by the facilitators. The mapping exercise can also be useful for visualizing the location of the challenges and the interrelationships between them, as well as for discussing the available resources and existing coping mechanisms. It is important to note that the discussion should cover not only climate hazards and challenges, but also other challenges and hazards in general, whether environmental, social or something else, in order to see how the climate issues fit within the other issues of concern in the community. Suggested questions for breakout groups during participatory mapping sessions, for eliciting information on community-level values, assets, hazards and challenges, are listed in Box 6.

Box 5. Activities in initial participatory workshop

1. Identify community values and assets through breakout group discussions or community mapping.
2. Identify environmental and other challenges and rank them in order of priority through group discussions and voting.
3. Identify historical responses and coping strategies associated with the challenges and discuss their effectiveness.
4. Design and select priority adaptation interventions by discussing community members' common future aspirations and through priority voting.
5. Plan priority interventions through forecasting or backcasting.
6. Identify the costs, benefits and overall impact of priority interventions from the perspective of the community members, also in relation to forest management and REDD+, through breakout group discussions.

(c) Identifying priority adaptation interventions

Once the values, challenges and assets have been identified, the next part of Step 2 is to rank adaptation interventions in order of perceived importance. This process has two parts: (a) future visioning and voting, and (b) backcasting and forecasting.

Figure 5. Map of the *barangay* showing important resources, challenges and hazards, and coping mechanisms. Photo by Gordon Bernard Ignacio/GIZ.

Box 6. Questions and steps for value and hazard mapping

Values and assets

A. "What is important to you?"
"What do you value in the community?"
"What assets are available?"
Important assets (natural resources, physical, financial, social assets such as networks and sharing groups, etc.) are marked on maps or Post-It notes.

B. Facilitator clusters Post-It notes or asset categories from the maps. If using maps, groups give short presentations before the clustering. Discussion with the whole group.
- How are assets and resources used? Who has access and when?
- Which assets are abundant and/or easily available? Which are not?
- Have there been any changes in availability over the years?
- What about forest and tree resources?

C. Priority voting and ranking of asset clusters using dots or stickers.
Why are certain resources of priority and others not?
Include discussion on priority voting for forest resources.

Hazards and challenges

A. In breakout groups:
"What hazards and challenges are you facing now or have faced in the recent past?"
For example, water access and quality, erratic rainfall, erosion, health challenges, conflicts, etc.
Draw these on the map or write them on Post-It notes.

B. Clustering in categories and group discussion with whole workshop (as above).

C. Priority voting and ranking of challenge category clusters (as above).

D. Mind map of the linkages between the challenges resulting from the discussion if time permits.

Discussion points:
- Are there any trends or changes in the frequency of events over time?
- What major changes has the community experienced?
- What are the effects of the hazards/challenges on what you value? What impact do they have on your life? How does this relate to priority ranking?
- Are there any links between the hazards/challenges? Does one affect the other?

Future visioning and voting

To plan and rank adaptation interventions in a context of multiple stressors, participants in the case study workshops were asked to envision a future where stressors and challenges are addressed in an integrated manner, with existing assets and resources mobilized wherever possible. Future visioning helps to assess what

Box 7. Resources and challenges in Setulang (ID)

Resources

When asked to list and rank the resources (environmental, social, human, financial etc.) and assets of value in their community and assess their status (e.g. availability and accessibility), women and men gave different responses. Both women and men listed water, agricultural assets and human resources but with different rankings; men also mentioned social, financial and forest resources.

Rank	Women		Men	
	Resources	Status	Resources	Status
1	Water	River water has deteriorated. Only water from Tane' Olen spring is good.	Human	Same statements as made by women's group.
2	Human	Diminishing as educated young people seek opportunities in big cities and do not return to Setulang.	Social	Social bonding and cohesion is still strong. Easy to mobilize collective action.
3	Agriculture	Harvest is decreasing and although it is enough to cover needs, the surplus people are able to secure is diminishing.	Financial	Some financial resources can be dispersed for community projects from village groups and government agencies but it is still not sufficient.
4			Water	Amount of spring water channeled to the village is inadequate — pipe is too narrow.
5			Forest	Forest resources currently in good state but worries about the availability for future generations.
6			Agriculture	Same as women.

Challenges

The community reduced a large number of challenges and hazards to a short list of eight priority challenges, ranked in the following order:

1. Tenure-related social conflicts with neighboring villages and concessions
2. Alcohol and drug abuse by the young
3. Abuse of political power
4. River pollution
5. Floods
6. Diseases (diarrheal, infectious, vector-borne)
7. Prolonged dry seasons
8. Illegal logging

Interestingly, even though floods, droughts and other environmental and climatic hazards are frequent in the area, people did not rank them as the most important challenges. People believed that they have the potential to cope well with these climate hazards (e.g. by elevating their houses, managing their forests, keeping a sufficient crop surplus and maintaining grain storage facilities on safe ground), whereas social challenges such as conflicts have a more profound impact both on their lives and on their overall ability to cope with all the other challenges.

people aspire to and how they envision their community after challenges have been resolved.

Future visioning was conducted in breakout groups through community mapping. Group representatives were asked to present their village maps for 2030 (or another timeframe depending on the planning horizon), explaining what has changed from the current situation. Components that emerged from all the maps of the future were clustered into groups and rephrased as adaptation statements (aspirations) for making strategies. Participants were then asked to give their priority votes to each aspiration cluster. Suggested questions to facilitate the visioning and planning exercise are listed in Box 8.

Backcasting and forecasting

Once adaptation aspirations have been voted on, they can be selected for strategic planning. Planning can be done through either backcasting or forecasting.

Backcasting was used in Sogod. Backcasting is a process of systematically moving backward from a desired future situation to the present by continuously asking: "what must we do to achieve this?" (Sova et al. 2012). In Sogod, backcasting and

Box 8. Questions and steps for future visioning and adaptation planning

Aspirations and visions for the future

A. Breakout groups.
"What do you want your community to look like in the future?" (Imagining the community in 15–30 years from now (when challenges are addressed and/or capacity to cope with them is strengthened))
"What are you doing now that you were not doing before?"
"What are you doing differently?"
"How has your life changed?"

B. Groups give presentations.
Facilitator leads discussion that culminates in a list of key features/aspirations for the future grouped in clusters.
Include discussion on the future status and use of forest and tree resources.

C. Voting and ranking of clusters.

Planning adaptation interventions

Could be done in two big groups (or smaller breakout groups if there is a large number of participants)

A. "How do we achieve our aspirations?"
Participants are encouraged to think about the challenges and assets listed during the previous day as possible inputs.
   a. What resources, assets and knowledge will be needed, and when?
   b. What additional resources are needed?
   c. How are activities situated in space and time?
   d. What are the inputs and outputs in each step?
   e. What are the costs and benefits?

B. Groups report back, presenting their planning.
Discussion with whole workshop.

C. Discussion with whole group.
   a. Discuss all inputs and outputs across space and time (e.g. for establishment, harvesting, maintenance, etc.)
   b. What impact will this strategy have on everyone in the community? How will it change life in the community?
   c. Discussion should be facilitated in such a way as to be able to identify quantifiable proxies associated with each impact (see Step 4). For example, a proxy of impact could be fewer visits to the medical clinic because of improvements in health.
   d. What additional inputs might be needed to tackle challenges? What are the risks and associated management strategies? What are the possible unintended consequences or negative impacts?

D. Priority voting and ranking of the main impacts if time allows (Figure 6).
Community assesses the relative importance of each impact (e.g. more time for children to attend school, better farming, better health, etc.).

Figure 6. Priority voting on adaptation aspirations in Setulang (ID). Photo by Emilia Pramova.

planning were conducted using a large sheet of paper and Post-It notes. The desired future characteristics were placed on the right side of the paper, with the current situation and available assets and resources placed on the left. Participants were asked to consider all the positive (intended) and negative (unintended) impacts that might occur during each phase of implementation.

In Setulang, planning was done through forecasting. Forecasting involves 'predicting' all the intended and unintended consequences, as well as the costs and benefits, of an intervention by systematically moving forward from the present to the desired future situation in progressive milestones. The list of priority community assets was kept visible during the planning exercise to foster discussions on how best to mobilize them during the implementation process.

Communities can also work toward developing a theory of change associated with the priority adaptation strategy or strategies. A theory of change illustrates how a group of early and intermediate actions lays the foundation for long-term results and impacts. It clearly articulates the assumptions about the process through which change and impact will occur, and specifies the ways in which all of the required actions related to achieving the desired impact will be implemented. Participants are asked to predict exactly who or

Box 9. Priority adaptation interventions and aspirations in Setulang (ID)

A number of community aspirations emerged from the future visioning exercise. These were then grouped into strategy clusters and Setulang villagers prioritized those interventions that they can start implementing by mobilizing assets already present in the village. Three strategy clusters were discussed: (i) agricultural development; (ii) management of the protected forest area and livelihood diversification; and (iii) village area management.

The agricultural development strategies have multiple objectives. One important objective is to develop new fields with good economic opportunities to offer the young an attractive alternative to migrating to the city. Planting a greater variety of crops, beyond rice and cassava for example, is also expected to enhance livelihoods and food security under the threat of droughts and floods. The development of rubber, fruit,

continue to next page

Box 9. Priority… Continued

coffee and cocoa production through agroforestry systems is expected to increase overall resilience and sustainability under climate change. Rubber was particularly emphasized, as several Setulang villagers have observed the good economic returns that other villages have had from selling latex.

The management of the protected forest area of Setulang (Tane' Olen) encompasses aspirations for various tourism, resource management and alternative livelihood activities. The villagers wish to increase the economic returns of managing Tane' Olen sustainably, while preserving biodiversity to create resilient ecosystems and their own cultural practices. Interventions identified for achieving this goal included ecotourism, NTFP resource inventories and sustainable management. One important NTFP is rattan, which the Setulang community uses to make traditional handicrafts and household utensils (e.g. mats, baskets, etc.). These handicrafts themselves are a tourist attraction, as the Dayak Kenyah use distinctive and beautiful patterns, and a handicraft market could be created to foster alternative livelihoods and communication of Dayak culture to visitors.

The strategies related to enhancing village management are linked to multiple objectives and expected benefits. The construction of a new longhouse, for example, which will link to the objective of having new housing areas on higher ground, will help the villagers deal with the negative impacts of flooding events. The longhouse will serve as temporary housing not only for people affected by flood but also for tourists, and as a hub for cultural activities.

Example of intervention: Rubber agroforestry

Rubber agroforestry can involve intercropping of rubber trees with locally important fruit trees such as rambutan (*Nephelium lappaceum*), durian (*Durio zibethinus*) and petai (*Parkia speciosa*), as well as rice during the first 1–2 years. The community perceives improved overall economic welfare, achieved through both livelihood diversification and a cash crop (in this case rubber), as the most important direct benefit. Increased resilience to climatic hazards is also appreciated, as rubber agroforestry can withstand flood and drought pressures better than annual crops (e.g. rice) and will also contribute to diversifying the portfolio of crops available for cash and direct consumption throughout the year.

Furthermore, rubber agroforestry is a means of rehabilitating degraded land that would normally be left fallow for some time. As managing rubber agroforestry is not perceived as very time consuming, stakeholders pointed out the additional benefit of having free time to undertake other agricultural or livelihood activities. Another important benefit mentioned by the Setulang community is that the development of rubber production will give young people a reason to stay in the village because it would be an attractive economic activity for them.

In terms of costs, in addition to inputs such as seedlings and labor, time and resources will be required to learn rubber agroforestry techniques. The community members also see marketing and selling of latex as easy, as buyers have approached the villagers in the past.

what will change, by how much, and when and where, at every single step toward the future; they are also asked to explain how they expect a change to happen and why it might happen in that way. This exercise can be fairly complex, despite its similarity to forecasting or backcasting planning, so skilled facilitators will be needed to guide the groups.

Tools and resources

Dazé A, Ambrose K and Ehrhardt C. 2009. *Climate Vulnerability and Capacity Analysis Handbook*. CARE International. Includes field guides for applying participatory tools in community-based adaptation planning. http://www.careclimatechange.org/cvca/CARE_CVCAHandbook.pdf

Anderson AA. 2006. *The Community Builder's Approach to Theory of Change: A Practical Guide to Theory Development*. Aspen Institute Roundtable on Community Change. http://www.aspeninstitute.org/sites/default/files/content/docs/rcc/rcccommbuildersapproach.pdf

Sova C, Chaudhury A, Helfgott A and Corner-Dolloff C. 2012. *Community-Based Adaptation Costing: An Integrated Framework for the Participatory Costing of Community-Based Adaptations to Climate Change in Agriculture.* Working Paper No. 16. Cali, Colombia: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). http://ccafs.cgiar.org/sites/default/files/assets/docs/ccafs-wp-16-psroi.pdf

Step 3: Analysis of adaptation interventions and REDD+ objectives

(a) Consulting with stakeholders at various scales

Depending on the area, context and the priority adaptation interventions selected by the community, consultations with a range of stakeholders could add value. Stakeholders might include local and regional government agencies, nongovernmental organizations, traditional people's organizations and community groups, the private sector (e.g. rubber-processing industry), technical experts in each field (e.g. forest management, agriculture, agroforestry) and research institutions. Consultations with experts, local partners and institutions, and other stakeholders within and outside REDD+ projects can be useful for refining the technical design of the adaptation interventions suggested by the communities in Step 2; for example, they might provide more precise estimates of inputs and outputs for maximum productivity of an agroforestry intervention. Consultations can also provide better understanding of the costs, benefits, challenges, opportunities and risks associated with the implementation of the strategies, especially in relation to forest management and REDD+. The adaptation interventions can be further refined through information from the related literature and secondary data, and a preliminary cost–benefit analysis could be made. Another important goal could be to gain stakeholders' support for the interventions and foster cooperation where possible and appropriate. Consulting with stakeholders at different scales may also create an opportunity to explore ways to potentially include the proposed adaptation activities in existing programs and projects. Possibly the best format to conduct these consultations is through a participatory workshop. The benefit of using participatory workshops is that they provide a space where stakeholders across scales can interact, thus simultaneously allowing for various points of view to be collected. Workshops not only foster efficiency, but also give researchers and facilitators an understanding of power dynamics and social cues that may not be evident when conducting individual interviews.

In Sogod, for example, a 1-day workshop was organized with 31 provincial-level stakeholders in Maasin, the capital of Southern Leyte. Representatives from Local Government Units, different management units within the Department of Environment and Natural Resources (DENR, which includes the Community Environment and Natural Resources Office), and a number of local and provincial government offices such as Agriculture Reform, Community-based Forest Management and Planning and Development participated. Forestry experts and researchers from Visayas State University also attended. Two representatives from the community workshop were invited to communicate the outcomes from the community consultations.

The main objectives of provincial-level consultations were to communicate the results from the community workshops and the climate and vulnerability analysis, elicit perceptions on the critical challenges in the region related to adaptation and forest management/REDD+, and discuss the costs, benefits, challenges, opportunities and risks associated with the priority adaptation interventions identified by the community.

The following activities were included, in this order:

1. presentation of community perceptions of important resources, challenges and coping strategies in Sogod (by community representatives and facilitators)
2. presentation of the preliminary results from the climate and vulnerability analysis and discussion (by the vulnerability analysis lead)
3. group work identifying the main challenges and associated coping strategies and solutions from the perspective of the provincial stakeholders (by community representatives)
4. presentation on the two priority adaptation interventions selected by the community (by community representatives and facilitators)

5. group discussion on the costs, benefits, challenges, threats and opportunities related to the priority interventions with a special emphasis on forest resources and forest management (by workshop facilitators)
6. presentation on the progress of REDD+ activities and discussion (by the GIZ team in the Philippines).

In Malinau, however, a participatory workshop could not be organized because participants' schedules conflicted. Instead, semistructured interviews were conducted with each stakeholder individually. The main objectives of the district-level stakeholder interviews were to communicate the results from the community workshop and climate and vulnerability analysis, elicit perceptions on the critical challenges faced in the district related to adaptation and forest management/ REDD+, and discuss the costs, benefits, challenges, opportunities and risks associated with the priority adaptation interventions identified by the community. The semistructured interview guide that was used in the discussions is presented in Annex 1.

Following the district- and provincial-level consultations —if time and resources allow— going back to the community to discuss the outcomes of these consultations and any additional costs and benefits not previously identified will further enrich the analysis. Semistructured interviews can help guide these discussions with a representative sample of the study community, including participants from the community workshop (as described in Step 2) and others who did not attend. These discussions would aim to validate the incorporation of all workshop findings and the preliminary cost–benefit calculations if available, discuss any assumptions derived from the literature or expert consultations, and identify possible next steps toward implementation. New costs and benefits, household consumption and behavioral data, and alternative community interpretations of technical or market assumptions can also be uncovered during the semistructured interviews.

Stakeholders also identified several opportunities associated with the two interventions. Secure land tenure would lead to more profitable and sustainable rural livelihoods, and investors could be invited to work with farmers in further developing livelihoods and economic activities. Assistance from local government agencies is available for making forest land-use plans; the *barangays* could tap into this, especially given the strong partnerships between local government units and national government agencies such as DENR in Southern Leyte. Financial and technical support from donors could also be sought and they could apply for credit support programs for agricultural production and social infrastructure development (e.g. cooperatives). Financial and technical support is generally easier to obtain when land tenure is secure and *barangays*/local government units

Box 10. Contribution of provincial-level stakeholders to adaptation and interventions in Sogod (PH)

The communities of the upland *barangays* of Sogod municipality identified two priority adaptation interventions during the local-level workshops: (i) securing land tenure and (ii) restoring abaca (*Musa textilis*) production and related livelihoods through agroforestry. The benefits of these interventions, as perceived by the community, included greater economic welfare, stronger capacity to deal with environmental and socioeconomic problems through a functioning People's Organization (PO; establishing POs is a necessary step to secure land tenure), greater resilience of abaca and agricultural production in the face of climatic and other threats, and establishment of new livelihood opportunities for women from abaca fiber processing. Costs identified by the communities were associated with the inputs for abaca agroforestry production, time invested for establishing and running POs, land-use planning, resource inventories and other activities associated with using community-based forest management agreements (CBFMAs) and Certificates of Stewardship to help secure land tenure. These two adaptation interventions, along with the costs and benefits identified, were presented to provincial-level stakeholders to integrate their wider perspectives into these interventions.

Provincial-level stakeholders identified some additional costs, benefits and challenges linked to these two interventions.

Costs and benefits as perceived by provincial-level stakeholders

	Securing land tenure	Abaca agroforestry
Costs	• Resource surveys and inventories • Formulation of forest land-use plans (FLUPs)	• Increase in land prices • Capacity building for related agencies responsible for extension services
Benefits	• Ownership of area and tenure security • Improved household income for beneficiaries • Increased agricultural production • Proper allocation of land and sustainable management of forests and other resources • Containment/control of in-migration and encroachment on forested areas • Community organization and participation in planning processes • Greater results from awareness and education campaigns channeled through the POs	• Development of handicraft enterprises and job opportunities for women • Enhanced/more attractive rural employment • Increased household income

	Securing land tenure	Abaca agroforestry
Challenges	• Maintaining the commitment of local government units to implement the FLUP and the availability of technical staff to facilitate the CBFMAs and tenure agreement processes • Long approval process for CBFMAs • Clarifying activities, determining the cost of the process, and delineating the land areas are initial challenges • Speculators may take advantage of the newly established tenure agreements, which could lead to farmers selling off their tenured lots • Benefits of containing migration and encroachment on forested zones may not ensue if secure land tenure leads to enhanced livelihoods and economic development, attracting new settlers from the lowlands in search of land • 'Loan sharks' taking advantage of farmers who implement intervention on their plots • Exploitation by middlemen along the value chain if cooperatives are not established • Conflicts with government forest protection policies if agroforestry is practiced in the forest margins or within forested lands	• Adoption of intercropping practices to reduce diseases • 'Loan sharks' taking advantage of farmers who implement intervention on their plots • Exploitation by middlemen along the value chain if cooperatives are not established • Conflicts with government forest protection policies if agroforestry is practiced in the forest margins or within forested lands

participating in CBFMAs have preferential access. POs also have more access to training and seminars, which will further enhance their capacity.

With abaca agroforestry, an intervention could aim to support semi processing and other value chain activities such as weaving, as mentioned by the communities. This intervention also provides an opportunity to make use of the extension services offered by the Fiber Industry Development Authority (FIDA) and other agencies. FIDA has already offered abaca extension support, education and training services to farmers in the country, such as farmer field schools and training in fiber-craft making (e.g. handmade paper and woven fabrics), and the development of postharvest facilities such as stripping centers and drying facilities. The Department of Agriculture also offers abaca support programs. One example is the establishment of abaca solar and mechanical dryers through the Abaca Production Enhancement Program, whose aim is to stabilize abaca fiber supply throughout the year and increase farmers' income. The high demand for abaca products abroad and the global competitiveness of the Philippines in the fiber handicraft industry are other opportunities.

(b) Viability of interventions

Scenarios of future climate are mostly uncertain. Given this uncertainty, any proposed adaptation interventions must be analyzed with reference to all of the main future climate threats, as a way to assess the viability of the interventions. The particular climate conditions and thresholds at which an intervention fails or stops being effective need to be singled out in order to identify any additional potential vulnerabilities (and to elaborate plans to address them). This exercise is also useful for pinpointing early warning indicators that could be embedded in a process of adaptive management once implementation begins. Providing information on the critical thresholds and setting up monitoring systems based on the associated indicators can help foster preparedness and minimize any potential losses.

Stakeholder consultations should be held to discuss preparedness to implement an intervention. Preparedness relates to any additional measures (e.g. irrigation) that are needed if there is a danger of exceeding thresholds (e.g. 30 consecutive days without rain). The same analysis and process could also be applied to economic and social thresholds of success or failure. The critical questions on the climate and biophysical thresholds are similar to those of the desktop climate and vulnerability analysis. Information on thresholds could be gathered either from secondary data and literature reviews or through consultations with experts. The analysis of exposure (Step 1) and stakeholder perceptions of climate hazards and threats (Step 2) should be integrated into the overall viability assessment conducted with stakeholders from different scales.

(c) Linkages with REDD+

The linkages between effective REDD+ implementation and CBA interventions can be explored through one of two paths: (i) the current situation continued into the future where short-term coping strategies are employed under more frequent and intense climate threats; (ii) an alternative future where the selected adaptation interventions have achieved their intended outcomes. The second path is explored under the assumption that any challenges and unintended consequences of the adaptation interventions are managed appropriately. The linkages can be explored based on the stakeholder perceptions elicited during the workshops or consultations, as well as with a literature review (e.g. evidence from field studies conducted in similar settings) and expert consultations.

Box 11. Viability of rubber agroforestry interventions against major climate threats in Setulang (ID)

Studies on rubber sensitivity to climate hazards are scarce and are predominantly from Thailand and Malaysia. The temperature range for rubber growth is between 22 and 35 °C, although the optimal growth temperature is 25–28 °C. High rainfall (>2000 mm/year) is needed, but it must be evenly distributed and not interfere with tapping and latex collection. A dry period of up to 1 month is tolerated well, but extended dry periods could lead to yield losses.

Consequently, the biggest threats to rubber production are extended drought due to El Niño and heavy precipitation events that could inflict flood-related damage. The combination of higher temperatures and more intense precipitation could also lead to more outbreaks of rubber pests and diseases.

To minimize the adverse effect of dry spells during the establishment period, well-grown poly-bagged plants with a good root system can be used for deep planting. This can be followed by mulching with rice straw, as the high potassium content of rice straw will help alleviate any moisture stress on the plants.

The productivity of fruit tree species could also be reduced by extreme climate temperature and precipitation values. Durian, for example, grows best with mean annual temperatures of 22 °C and a mean annual rainfall of 1500–2000 mm. Soils should be well drained to limit losses from root rot. Rambutan, by contrast, has higher tolerance and can thrive with annual mean temperatures as high as 35 °C. However, this species does not favor waterlogging either.

Producing rubber through agroforestry could significantly minimize the risks associated with reductions in yields, as produce will be diversified and the nutrient cycles improved. However, readiness to employ additional measures such as irrigation and drainage canals is essential to prevent damage from drought and heavy precipitation.

Tools and resources

Chambwera M, Baulcomb C, Lunduka R, de Bresser L, Chaudhury A, Wright H, Loga D and Dhakal A. 2012. *Stakeholder-Focused Cost–Benefit Analysis in the Water Sector: A Guidance Report*. London: International Institute for Environment and Development (IIED). Although it targets the water sector, the document also discusses the stakeholder-focused approach to planning and evaluating adaptation to climate change more broadly. http://pubs.iied.org/16524IIED.html

German L, Tiani AM, Daoudi A, Mutimukuru-Maravanyika T, Chuma E, Jum C and Yitamben G. 2012. *The Application of Participatory Action Research to Climate Change Adaptation in Africa: A Reference Guide*. Ottawa, Canada: International Development Research Centre (IDRC). http://www.cifor.org/online-library/browse/view-publication/publication/4036.html

A set of indicative guiding questions are suggested in Box 12 to aid the analysis of linkages (including both potential synergies and trade-offs between adaptation and REDD+). An example from the Philippines is given in Annex 2.

Box 12. Questions to explore when considering the linkages with REDD+

Path 1: Continuation of current situation into the future

- How do people cope with climate hazards or disasters and other challenges?
- Are any of these coping strategies based on forest resources? Which ones?
- Are any of these coping strategies having a negative impact on forest ecosystems and resources? Which ones?
- Are the coping strategies practiced in a sustainable manner?
  - Do they integrate (or have the potential to integrate) any longer-term resource management strategies?
  - Are they based on extractive and/or exploitative resource uses?
- How will the more extended, intense and frequent use of these coping strategies influence land use, forest ecosystems and resources, and forest management under REDD+?
  - What will happen if there are more frequent and intense climate hazards and no adaptation strategies are developed?
- Which factors influence the choice and application of coping strategies?
- Which stakeholders affect and are affected by the coping strategies?
- How will stakeholders be affected if they can no longer continue these strategies (e.g. because of more restrictive forest protection regimes)?
  - How will this affect vulnerability and adaptive capacity?
  - What alternatives might people resort to?

Path 2: Adaptation interventions successfully implemented

- How is the effective implementation of the adaptation interventions projected to influence land use, forest ecosystems and resources, and forest management under REDD+?
  - What are the costs and benefits associated with forest and land-use management?
  - How are the costs and benefits distributed among stakeholders? Are there any winners and losers?
- How will the effective implementation of the adaptation interventions influence the coping strategies of each group (e.g. decrease in exploitative forest resource uses)?

Tools and resources

CRiSTAL Community-based Risk Screening Tool — Adaptation and Livelihoods. CRiSTAL is a desktop tool for Windows that assesses the impacts of a strategy or project on local determinants of vulnerability and exposure so that it can better foster climate adaptation. It can be used for exploring the impacts of current coping strategies on ecosystems and resources, as well as the impacts of planned strategies. Under development is a new version of the tool — CRiSTAL Forests — that will address specific issues that are relevant to forest ecosystems and forest-dependent communities, including REDD+. http://www.iisd.org/cristaltool/download.aspx

weADAPT Forests and Climate Change Initiative: A collaborative and participatory initiative and knowledge platform looking at the synergies and trade-offs between forest-based adaptation and mitigation, including practical case studies. http://weadapt.org/initiative/forests-and-climate-change

Step 4: Impact mapping and cost–benefit analysis

(a) Impact maps and SROI of adaptation interventions

The impact map is the cornerstone of the SROI framework (Nicholls et al. 2012). It is designed to monetize economic, social and environmental impacts on stakeholders (Sova et al. 2012). It is similar to a theory of change where all chains of events (including inputs, outcomes and impact) across time and space are described for each stakeholder that affects or is affected by an intervention. It is based on stakeholder perceptions and additional research and data. Additional research is usually needed during forecast SROI evaluations (where impact has not materialized but is projected) for interventions with which stakeholders have had only limited experience.

The SROI guidebook states that an impact map should be composed of several elements (Box 13) that are analyzed for each stakeholder that either affects or is affected by the intervention. It is advised that this section on developing an impact map be read in conjunction with the example from rubber agroforestry in Indonesia, given in Annex 3. A more extensive description of the steps taken in making an impact map is in the SROI guidebook by Nicholls et al. (2012).

An impact map can be made in MS Word or Excel because it is essentially a table of information. More graphical representations of the impact map could also be made after the information in the table has been completed.

Box 13. Steps in the SROI impact map

1. Stakeholder concerned
2. Intended/unintended changes
3. Inputs (including $ value)
4. Outputs, or summary of activity in numbers
5. The outcomes (what changes)
   a. Description
   b. Indicator
   c. Quantity of change
   d. Duration
   e. Financial proxy
   f. Value in $
   g. Sources of information
6. Establishing impact
   a. Deadweight
   b. Displacement
   c. Attribution
   d. Drop-off
7. Calculation of impact

Work on an impact map starts with defining the scope of the evaluation, or the unit of analysis (e.g. is it a number of municipalities, the whole village, a fixed number of beneficiaries, 1 hectare?).

In the first column, put the name of the stakeholder group.

The intended or unintended changes column describes what has changed for the stakeholder following the intervention (e.g. development of alternative sources of income). It is a very short description of an outcome, which is analyzed further in the outcome section.

The inputs column comes next. Inputs are the contributions that stakeholders need to make in order to make the activity possible. Inputs are used up during the activity and could be material (e.g. money) or immaterial (e.g. time). A value in monetary terms should be calculated for each input, even if it is immaterial. Time, for example, could be valued by using the daily wages in the area as a financial proxy. This will ensure transparency in the full cost of the activity.

Outputs are the quantitative summary of an activity. For example, this could be 50 farmers trained in conservation agriculture, or 10 water tanks installed and functioning. The same output can be repeated for several stakeholders in the analysis if it is related to more than one group. In situations where stakeholders are contributing their time, the output — a number of hours — may be described in the same way as the inputs: a number of hours.

Describing the outcomes can be considerably more difficult. Outcomes are essentially related to the changes (whether positive or negative, intended or unintended) that stakeholders experience because of the intervention. A particular challenge could lie in associating the outcomes with the right stakeholder. For example, the "increased integration of minority groups" is not an intended change for the project funder or local government, but it is really a change for the minority groups. Sometimes, although a stakeholder contributes to the activity, they are not significantly changed by it.

The effects of some outcomes will last longer than others, and some will depend on the activity continuing whereas others will not. The time scale used is generally the number of years that the benefits of the intervention are expected to endure. This is referred to as the duration of the outcome or the benefit period.

Indicators are related to how the change that will happen is validated or measured. They are an important part of the impact map because they can be integrated into any monitoring and evaluation system during and after implementation if the interventions go forward. Particular indicators should be applied to each set of outcomes. Indicators are frequently expressed using terms such as "increased" or "decreased" by a certain percentage or number. Some caution is needed with the application of such indicators, however, because the baseline numbers before the activity starts will need to be known.

The next step is to identify the appropriate monetary values associated with each outcome. For material inputs and outputs, and costs and benefits that have an established market equivalent, this calculation is relatively straightforward. Valuation can be very tricky for social or environmental benefits such as more free time for women, enhanced social cohesion or increased biodiversity.

The SROI framework suggests using financial proxies to estimate the social value of nontraded goods to each stakeholder, because people's perceptions of the value generated by each outcome will differ. By estimating this value through the use of financial proxies and then combining these valuations, one can arrive at an estimate of the total social value created by an intervention. Care must be taken here to avoid double counting. Rises in income for people through salary (outcome for people) or for the local government through tax increases (outcome for government) are obvious examples given in the SROI guidebook. If an individual gets a job, their income rises and the state receives more taxes. In this case, the increase in income should be recorded after taxes have been deducted.

For financial proxies that are difficult to define based on existing data, another option is to use methods from economics, such as stated preference, contingent valuation, revealed preference, hedonic pricing and travel cost. In stated preference and contingent valuation, for example, people are asked directly how they value something, either relative to other things or in terms of how much they would pay to have something or to avoid it. This assesses people's willingness to pay, or accept compensation, for a hypothetical outcome. Some examples of financial proxies are given in Table 2.

Table 2. Examples of financial proxies for outcomes relevant to adaptation and REDD+

Outcome	Financial proxy
Women spend less time and walk shorter distances to fetch fresh water	Cost of time saved based on daily wage
Reduction in soil erosion and improvement in soil productivity	Cost of land restoration using other methods, market price of fertilizers
Decrease in flood impacts	Cost of damage from previous flood events over a 10-year period
Economic activities with good prospects are available for younger people, who have an incentive to stay in the village	Social costs of migration that are avoided (as defined by stakeholders)
Empowered communities are active forest and resource stewards	Cost savings to forest agencies related to forest patrolling, management and monitoring

IMPORTANT REMARK

As with every valuation of social and environmental outcomes, this method has its shortcomings, and many assumptions have to be made along the way. Furthermore, not every benefit or outcome can be quantified and monetized, for example, the outcome of increased quality of social interactions. Instead of putting an arbitrary number on such outcomes, the SROI impact map can serve to communicate them as they are perceived by the stakeholders, by including and describing them in the theory of change and the report. In this way, monetization plays an important but not exclusive role in evaluation and reporting.

The use of financial proxies to monetize sensitive and intrinsic values such as human life and biodiversity and the associated impacts is highly controversial in science, policy and practice. The very idea of reducing intrinsic values to financial terms is disturbing to many stakeholders. One aspect of this concern is whether different types of impact are commensurable: that economic, environmental and social impacts can be represented together on the same scale of value.

(b) Establishing impact

To establish the ‘amount’ and duration of the impact associated with a particular intervention, issues such as deadweight, attribution, drop-off and displacement need to be considered.

Deadweight is a measure (in percentage) of the amount of outcome that would have occurred even if the activity had not taken place. For example, a local program to enhance incomes and livelihoods contributed to a 7% increase in economic activity in the area, but during the same time, the regional economy grew by 5%. It should be investigated how much of the local economic growth was attributable to wider economic changes and how much to the specific intervention being analyzed. Deadweight can be more easily calculated for interventions that have already taken place (evaluative analysis) than for interventions explored through future scenarios (forecast analysis, for which this percentage has to be predicted).

Displacement is an assessment of the extent to which the outcome moved other outcomes to other places. This is not applicable in every SROI analysis. An example is a forest conservation program that reduces deforestation in one particular area but displaces it to a neighboring area that did not participate in the program. As with deadweight, this is more easily calculated in an evaluative analysis than in a forecast analysis.

Attribution examines how much of the outcome was caused by the contribution of other organizations or people, again calculated as a percentage. It shows the part of deadweight for which there is better information available and where outcomes can be attributed to specific people or organizations.

Drop-off assesses how strong the impact of an intervention is over time. In future years, the amount of outcome is likely to be less or, if the same, it will likely be influenced by other factors, so attribution to the intervention is lower. Drop-off is used to account for this but only for outcomes that last more than a year.

These concepts are used to measure and establish impact. Impact is calculated for each outcome by multiplying the quantity of the outcome by the financial proxy and deducting from this value any percentages for deadweight or attribution. This is repeated for each outcome to arrive at the overall impact of all outcomes resulting from an intervention.

To calculate the SROI ratio, several steps must be completed:

1. Project the value of all outcomes into the future (based on how long each outcome is expected to last).
2. Subtract any drop-off identified for each of the future time periods after the first year.
3. Calculate the net present value for all costs and benefits paid or received in each time period.
4. Calculate the ratio based on one of the following simple sums:
   a. SROI ratio = Present value/Value of inputs
   b. Net SROI ratio = Net present value/Value of inputs

It should be noted, however, that impact is hard to establish or predict when conducting a forecast analysis because forecasting is based on assumptions that may or may not be realized, and therefore, impacts may not actually occur. A sensitivity analysis can be conducted to assess the extent to which results would change under different assumptions (and also to see which assumptions have the greatest effect on total impact). The conditions that are projected to substantially influence impact can then be monitored during the intervention.

One recommended approach for conducting a sensitivity analysis is to calculate how much each estimate needs to be changed in order to make the social return become a social return ratio of $1 value for $1 investment (Nicholls et al. 2012). More conservative approaches (e.g. Maximin rule) can be applied to be able to state that at least a certain amount of impact will occur from the implementation of an intervention if the minimum of the achievable outcomes is considered. The following rules could be applied in a sensitivity analysis (after Kiffner et al. 2005):

1. Maximax: considers the maximum achievable impact (e.g. maximum amount of yields that can be expected from an agroforestry system, assuming that all produce is sold at fair prices, etc.)
2. Maximin: considers the minimum achievable impact (e.g. minimum amount of yields that can be expected with various % of produce sold at different prices, etc.)

Tools and resources

Nicholls J, Lawlor E, Neitzert E and Goodspeed T. 2012. *A Guide to Social Return on Investment.* Haddington, UK: The SROI Network. http://www.thesroinetwork.org/sroi-analysis/the-sroi-guide

Arvidson M, Lyon F, McKay S and Moro D. 2010. *The Ambitions and Challenges of SROI.* Working Paper No. 49. Birmingham, UK: Third Sector Research Centre (TSRC), University of Birmingham. http://epapers.bham.ac.uk/788/

Spearman M and McGray H. 2011. *Making Adaptation Count: Concepts and Options for Monitoring and Evaluation of Climate Change Adaptation*. Eschborn, Germany: Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. http://www.wri.org/publication/making-adaptation-count

Includes theories of change for establishing and evaluating adaptation impact and identifying related indicators.

Ellis J, Parkinson D and Wadia A. 2011. *Making Connections: Using a Theory of Change to Develop Planning and Evaluation*. London: Charities Evaluation Services. http://www.ces-vol.org.uk/tools-and-resources/Evaluation-methods/making-connections-tools/index

3. Hurwiez: combination of Maximax and Maximin with weighting of lowest and highest results and aggregating them to one value.

Step 5: Communication of results back to stakeholders

When the analysis has been completed, one final important stage remains: reporting back to stakeholders. Although some results might have already been communicated during Steps 1–4 (consulting stakeholders from different levels) and during any follow-up interviews with communities, the final report and impact map should be made available and, where possible, discussed with all stakeholder groups. Results should be communicated in a way that is meaningful to each stakeholder group, by considering the value that each stakeholder could derive from the analysis.

REDD+ project teams, for example, could use data from the analysis to plan additional adaptation activities that will enhance the achievement of forest conservation, restoration or sustainable use objectives. Communities could use the analysis and costing of interventions to decide upon the best mode of implementation and what kind of assistance to apply for. Information on major climate threats, possible future scenarios and sensitivity thresholds could help foster preparedness and the design of additional measures based on local priorities and resources. Local government agencies, nongovernmental organizations and other organizations active at the municipal or provincial level could use the report to plan interventions that are tailored to local challenges and needs.

If time and resources allow, validation of the final results by stakeholders should be sought. This process can serve a dual objective: to communicate the results and to make sure that stakeholders' perceptions and needs are captured accurately.

Finally, any reporting should encompass all the qualitative and quantitative aspects of the analysis and a clear description of the methods and assumptions used. It should provide each stakeholder with enough information on the social value that can be created (or not) in the course of an activity, clearly delineating the theory of change and all the uncertainties associated with the data and predictions. The analysis should stress both the positive and negative findings in a balanced and sensitive way. Finally, if adaptation activities proceed with implementation, enough time and resources need to be secured for monitoring and evaluation and to foster adaptive management.

Part 3: Concluding remarks

This guidebook has set out a five-step approach to integrating CBA into REDD+ projects by using multiple methods. In addition to a desktop review on vulnerability to climate change (Step 1) using climate data, a combination of participatory methods is proposed to capture the voices of multiple stakeholders at the community and broader levels. Steps 2 and 3 focused on the use of participatory workshops to bridge levels (e.g. community and provincial). Step 3 in particular involved consultations with stakeholders and different levels of analysis to examine the linkages between adaptation interventions and REDD+. Step 4, however, was much more quantitative, although heavily supported by the qualitative findings from Steps 2 and 3. Using multiple methods allows both for an assessment of local needs and interests, and for community-level adaptation costing. Many of the methods used in this guidebook can be applied in any context beyond Southeast Asia because they have been tried and tested in development planning over decades and across geographic boundaries.

Following this process will give REDD+ stakeholders greater awareness of the climate challenges in the area and the underlying causes of both community and ecosystem vulnerability in relation to adaptation and achieving REDD+ objectives. This exchange of information between adaptation and mitigation proponents builds better dialogue across sectors, bridges scales, and helps to create a more robust impact map for analysis and planning that encompasses multiple perspectives, thus increasing the likelihood that adaptation activities within REDD+ projects are well designed, relevant and appropriate.

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Annexes

Annex 1. Semistructured interview guide for district-level stakeholders in Malinau

Climate hazards, impacts and challenges		
Main questions	**Additional questions and probes**	**Clarifying questions**
• Can you tell me about the climate hazards affecting Malinau and/or your area of work?	• What impacts do these hazards have? • What are the effects of these impacts? • Which places are most affected and when? • Who is affected most and why? • Under what circumstances do serious problems arise? • Have you noticed any changes in the situation over the years?	• Can you expand a little on this? • Can you tell me anything else? • Can you give me some examples?
• In your experience, which climate hazards bother people the most? OR • In your opinion, what are the most worrisome climate problems in your area?	• Why?	
• What are the other important challenges (non-climate-related) in your area? OR • In your opinion, what are the other important problems in the area?	• Why do these problems occur? • What are the effects of these problems? • Who is affected most and why? • Have you noticed any changes in the situation over the years?	
• In your opinion, how will these challenges (both climate-related and non-climate-related) evolve in the future if no action is taken?	• Who will be affected, how and why? • How will these challenges affect forest management, especially in relation to your area of work?	
• *Discussion on the main hazards and challenges faced by the Setulang community.* • In Setulang, the people consider the following to be the five most important challenges: • Tenure-related social conflicts (with neighboring villages, concessions) • Drugs (abuse by the young) • Abuse of political power • River pollution • Floods	• What is your opinion on these issues? • What are the linkages between these challenges and the ones that we discussed earlier?	

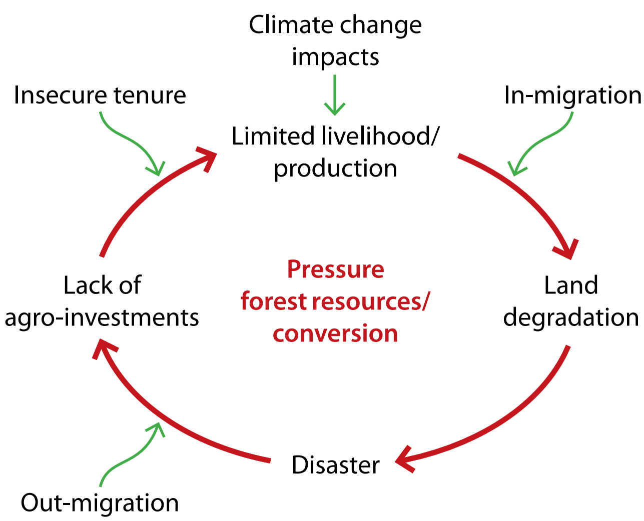
Resources and strategies		
Main questions	**Additional questions and probes**	**Clarifying questions**
• What kinds of assets and resources are available that could help in managing the challenges discussed earlier? • What other resources do you think are needed?	• Related to the specific assets/resources and strategies that the respondent will mention. • How can this asset/resource be used? • What will be the benefits of doing this? • Which target groups will benefit?	• Can you expand a little on this? • Can you tell me anything else? • Can you give me some examples?
• In your opinion, how will the activities of the Village Forest project and REDD help people in Setulang cope with the climate and non-climate challenges?	• What are the linkages between these activities and the assets/ resources that you mentioned earlier (if any)?	
• Discussion and questions related to the two main adaptation strategies proposed by the community in Setulang, which were selected for further analysis. Some indicative information on the strategies from experiences elsewhere could be provided. • Rubber agroforestry gardens (rubber trees intercropped with rice during the first years, and with fruit tree species): • In your opinion, what will be the benefits of this strategy? • What are the associated costs and/or barriers? • Improved use of non-timber forest products (e.g. rattan) for handicrafts and the marketing of these handicrafts: • In your opinion, what will be the benefits of this strategy? • What are the associated costs and/or barriers?	• For each strategy, A and B: • Which benefits and costs, from the ones you mentioned, do you consider to be the most important and why? • What other positive and negative impacts might occur from this strategy (for different kinds of groups, e.g. women, youth)? • How do you see the implementation of this strategy? • How will it affect your area of work? • What will be the impact of this strategy on forest management? • What will be the impact of this strategy on the REDD+ project objectives?	
Conclusion of interview • Are there any other important issues that you would like to point out? OR • Would you like to add anything to this discussion or to our study?		

Annex 2. Adaptation strategies and linkages with REDD+ in Sogod

Summary of current path: Coping level

The community and province-level workshops revealed a number of interacting challenges that all have negative implications for forests and their resilience, and consequently for the accomplishment of REDD+ objectives. For example, insecure land tenure inhibits investment in forest and resource management for both adaptation and mitigation, as well as in agricultural interventions such as agroforestry, which has several negative consequences. Given a lack of agricultural investments (especially ones with adaptation benefits), climate stressors and disasters such as flood and drought will reduce crop yields or even cause crop failure in the area. This in turn would force communities to clear more land in the uplands or to extract forest resources such as wild bats and NTFPs to supplement income and livelihoods (coping strategies).

The lack of forest management renders these resources, and the forests as a whole, more vulnerable to climate change (e.g. increases the risk of fires and degradation of ecosystem services such as carbon sequestration). Without secure tenure, communities have no incentive to engage in sustainable forest management or to employ proactive measures such as fire risk reduction interventions and monitoring. The combination of no agricultural investments (e.g. for more sustainable and resource-efficient practices) and climate pressures will have the compound effect of land degradation, which can result in even more forest encroachment. Encroachment is aggravated by the in-migration of settlers from the lowlands, especially in the absence of property rights and land-use planning. This is a difficult current situation for REDD+ implementation.



Linkages in current path

As seen elsewhere in the world, it is generally the poor and most resource-insecure that depend on forest resources after a disaster (Pramova et al. 2012). In Malawi, for example, forests appear important as a reactive adaptation strategy, particularly for households with no other options, but they do not currently play a role in anticipatory adaptation (Fisher et al. 2010). In Indonesia, people affected by floods sold and consumed wild pigs from the forest to supplement their livelihoods and food intake (Liswanti et al. 2011), while in Honduras, poor rural households sold timber as self-insurance after being unable to recoup land holdings lost during Hurricane Mitch (McSweeney 2005).

It is important to differentiate between products as safety nets for coping strategies (short term, usually after a disaster) and products as a major source of livelihood diversification for adaptation strategies (long term, proactive management of resources in anticipation of shocks). The poorest of the poor might turn to the forest during or after a disaster in order to survive, but some farmers also use forest ecosystem services and tree products as an integral income diversification strategy and maintain water and soil nutrients for dealing with climate variability on a constant basis. Many of these agrarian communities maintain trees on their farms for this purpose. When harvests fail because of climate events, people can sell fuelwood, fodder or other forest products from their farms to supplement income (Pramova et al. 2012).

With coping strategies such as those observed in Honduras, and also in Southern Leyte, Philippines, a heavy dependence on forest products to deal with climate events can be a source of vulnerability when the ecosystem is degraded or mismanaged, when conflicts arise between forest users or when access becomes restricted. The future value of natural assets and how communities will be able to use them under REDD+ are noted concerns (Peskett et al. 2008). As populations grow, and in response to other development or climate pressures, REDD+ may end up creating a situation where communities cannot rely on natural assets as much as they had previously, for example for cash income from logging, as safety nets in times of shock or as a source of agricultural land (Graham 2011). Consequently, it is critical to enhance the adaptive capacities of communities and integrate adaptation strategies into REDD+ planning to foster an effective transition from coping to adapting and to maintain carbon sequestration and other environmental services.

Adapting level — desired future situation

Stakeholders envision that the two adaptation strategies prioritized by the *barangays* — securing land tenure and abaca agroforestry — will have a mutually enhancing positive impact, but they will only do so if they meet their objectives and the challenges and potential unintended consequences are managed appropriately.

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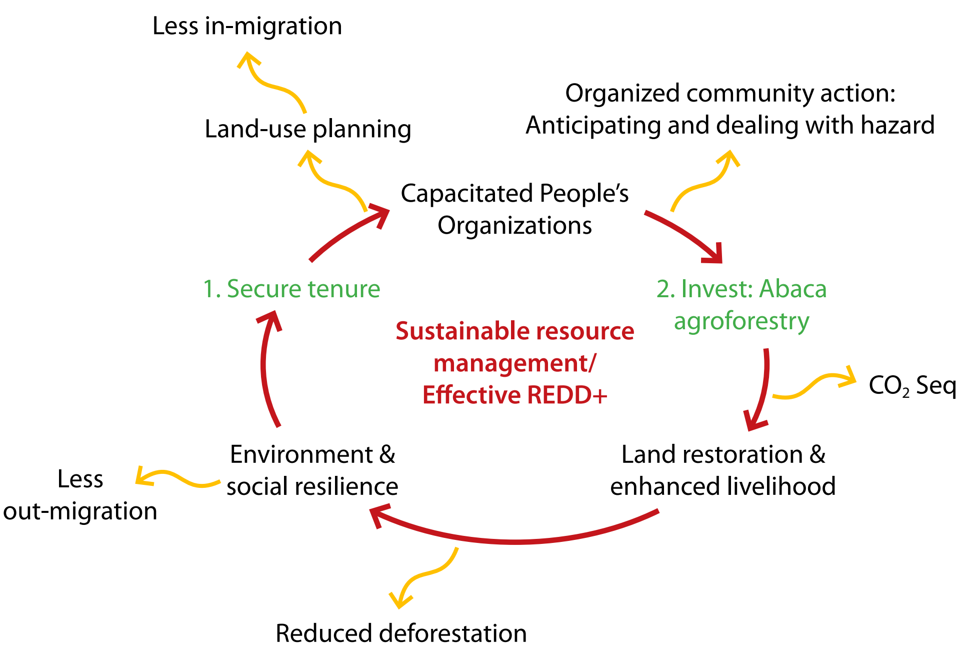
Annex 2.… Continued

With more secure land tenure and with functioning People's Organizations, or POs (a prerequisite to apply for CBFM and other co-management agreements), communities will have a greater incentive to invest in resource management and agricultural practices such as abaca agroforestry. Abaca agroforestry will in turn lead to enhanced livelihoods, diversified income opportunities and restoration of degraded land, all of which will contribute to a reduction in deforestation and to the sustainable management of resources and ecosystem services. The latter are a compound effect of secure land tenure, land-use planning and agroforestry. Tenure and land-use planning will minimize the negative effects of in-migration (e.g. encroachment on forested lands). Sustainable management of both forest and agricultural resources will lead to overall increased social and environmental resilience. The presence of functioning POs will further strengthen people's adaptive capacity to anticipate and deal with hazards effectively. This situation of 'adapting' will facilitate the successful implementation of REDD+ by protecting carbon sequestration and the triple objectives of adaptation, mitigation and development.

Positive indirect impacts on REDD+ can occur when an adaptation project prevents activity displacement and induced deforestation. An example is if an agricultural adaptation intervention sustains crop productivity and livelihoods and reduces the clearing of forest for agricultural expansion (Locatelli 2011). The evidence on



Map of future path

these linkages from the climate change literature is scarce but studies have been conducted on the relationships between practices such as agroforestry and CBFM (which are relevant for adaptation) and reduced deforestation (relevant for REDD+) outside of the climate change debate.

Empirical evidence from Nepal (Gautam et al. 2002; Oli and Kanel 2006), Mexico (Bray et al. 2006) and Vietnam (Nguyen et al. 2009) shows that community forestry can actually lead to increases in forest cover in areas where decreases are usually the norm (as cited in Roe 2010). If implemented through secure tenure arrangements, community forestry also has the potential to lift people out of poverty (Sunderlin et al. 2007). Another case from Sumatra, Indonesia, demonstrated that the recognition of community property rights over forests has led to a decrease in deforestation, increase in land restoration and an overall reduction in the risk of forest fires (Suyanto et al. 2005). However, local communities can only become effective forest stewards when acquired rights are duly recognized, avenues exist for meaningful participation, forest management costs and benefits are distributed fairly, and appropriate external support is provided, as suggested by case studies from South America (Cronkleton *et al.* 2008).

The potential of agroforestry to enhance rural incomes, increase resilience to climate hazards, and restore degraded land has been well documented (Verchot et al. 2007; Garrity et al. 2010; Pramova et al. 2012). However, agroforestry can also have direct and indirect effects on climate change mitigation through carbon sequestration and reduced deforestation, respectively. The Alternatives to Slash and Burn program documented the carbon sequestration and storage of different agroforestry systems (Verchot et al. 2007). Converting row crops or pastures into agroforestry systems can greatly enhance the carbon stored in above-ground biomass because agroforestry systems contain 50–75 Mg C ha^{-1}, whereas row crops contain <10 Mg C ha^{-1}. Intercropping with fruit trees and other agroforestry systems have also been found to be more profitable than short fallow monocultures and row crops, which are the typical focus of agricultural intensification programs (Gockowski et al. 2001).

Agroforestry systems can have benefits for biodiversity and forest adaptation because they can serve as biological corridors and also reduce human pressure on natural forests (Schroth 2004; Bhagwat 2008). It has been demonstrated that agroforestry systems host significantly more species than monoculture systems (Bhagwat 2008). In these ways, agroforestry production, even at the forest margins, can be beneficial to both people and forests.

Studies from Kerinci Seblat National Park in Sumatra, Indonesia, have shown that households that own mixed gardens with trees extract much fewer resources from the national park than households that cultivate rice fields alone (Murniati et al. 2001). A similar situation was observed around the Nyungwe Forest Reserve in

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Annex 2.… Continued

Rwanda (Masozera and Alavalapati 2004). Research in small islands of the Pacific has also demonstrated that the presence of valuable trees for livelihoods outside of the forests significantly reduced deforestation and forest degradation in reserves (Bhagwat 2008).

However, certain conditions have to be present to give farmers an incentive to invest in agroforestry, illustrating once again the connections between the two adaptation strategies selected by the *barangays* in our case. Several studies have demonstrated the decisive roles that secure land tenure and decentralized decision making at the community level play in agroforestry adoption rates among farmers (Suyanto et al. 2005; Swallow et al. 2006; Tougiani et al. 2009; Sendzimir et al. 2011). Those without secure tenure or property rights are less likely to participate in agroforestry initiatives because the cultivation of trees requires an investment over many years (Garrity 2004; Pramova et al. 2012). The type of agroforestry system selected should also be responsive to local needs (e.g. needs for particular products such as fuelwood or fruits) and biodiversity (Tougiani et al. 2009; Graham and Vignola 2011).

A greater and more diverse asset base (including natural, physical, financial, human and social assets) enhances adaptive capacity at the local level (Plummer and Armitage 2010). How REDD+ is implemented will also influence community assets. For example, achieving secure tenure and CBFMAs as part of REDD+ can provide an opportunity to provide training and education to local communities on sustainable forest management, improved agricultural techniques, and monitoring, reporting and verification of REDD+ activities. Human capital will thus be built, with positive impacts on adaptive capacity (Graham 2011).

Further synergistic benefits from the joint implementation of REDD+ and adaptation strategies could be pursued in order to maximize the overall positive impact. For example, REDD+ networks and finance could be used to deliver timely climate information and knowledge that is of relevance for the adaptation not only of agrarian communities but also of forests (Graham 2011). Such information could be integrated into an adaptive governance and management model, where the results of different interventions are constantly monitored, evaluated and readjusted according to changing circumstances and needs (e.g. changing drivers of deforestation and degradation, changing climate pressures). Adaptive management should be the foundation of any intervention under uncertainty.

Source: Pramova et al. (2013b).

Annex 3. Sample impact map

Rubber agroforestry

Stakeholders	Intended/ unintended changes	Inputs		Outputs	Outcome
1. Who will be affected? Who will produce the effect?	**2. What will change for the stakeholders?**	**3. What is invested?**	**4. Monetary value**	**5. Summary of activity in numbers**	**6. How would you describe the change?**
FARMERS	Enhanced livelihoods and food security under climate hazards	(i) Land; (ii) Seedlings; (iii) Fertilizers; (iv) Labor and time; (v) Formic acid. As described in CBA per hectare	Described in CBA per hectare	550 rubber trees intercropped with 100 durian trees per hectare	(i) Income is diversified with rubber throughout the year and with fruit according to seasons; (ii) Income source is not as climate sensitive as annual crops.
	Degraded land is rehabilitated				Reduction in erosion and improved water regulation during drought and intense precipitation.
	More free time				Farmers have time to engage in other activities (e.g. rice production or other livelihoods) as the system is low maintenance and rubber tapping is not very labor intensive.

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Annex 3.… Continued

Outcome					Adjusting impact: "What else contributed to the change?"			
7. Indicator: How do you measure the change?	**8. Quantity: How much change?**	**9. Duration: How long does it last?**	**10. Financial proxy: What would you use to value the change?**	**11. Value of change ($)**	**Dead-weight[a]**	**Attribut-ion[b]**	**Drop-off[c]**	**Impact[d]**
Annual rubber and fruit yield and income	After year 8, as described in CBA per hectare	30-year rotation of rubber; durian can fruit for 60 years	Farm gate price of yields (CBA)	As described in CBA per hectare	0%	0%	10–30% from year 18 for rubber[e]	As in CBA per hectare
(i) Extent of degraded land under production and (ii) Improvement in water regulation (e.g. during floods)	1 ha per household	30-year rotation	(i) Covered by additional income above; (ii) Cost of % avoided flood damages	(i) As described in CBA; (ii) Unknown				
Time allocated for other activities (both on and off farm)	Unknown	30-year rotation	Any additional income from other activities (market prices)	Unknown				

a % of outcome/change that would have happened without the intervention

b % of outcome/change that was induced by other stakeholders not mentioned here/outside forces

c % of outcome dropping-off (% of effect diminishing) in later years

d Quantity times (*) financial proxy minus (–) deadweight, attribution and drop-off

e Rubber yield decreases: year 19–20 (decrease 10% from year 18), year 21–22 (decrease 15%) and year 23–25 (decrease 30%).

Stakeholders	Intended/unintended changes	Inputs		Outputs	Outcome
1. Who will be affected? Who will produce the effect?	**2. What will change for the stakeholders?**	**3. What is invested?**	**4. Monetary value**	**5. Summary of activity in numbers**	**6. How would you describe the change?**
Setulang village	Increase in overall economic well-being	(i) Land; (ii) Seedlings; (iii) Fertilizers; (iv) Labor and time; (v) Formic acid. As described in CBA per hectare	Described in CBA per hectare	550 rubber trees intercropped with 100 durian trees per hectare	Community has more surplus cash to invest in village infrastructure and facilities, etc.
	More young people remain in the village				Fewer young people migrate to cities, as they consider the economic activities in the village attractive. Presence of the educated younger generation also increases village well-being.
	Conflicts with other villages are aggravated				More disputes filed (or re-filed) for settlement.

Outcome					Adjusting impact: "What else contributed to the change?"			
7. Indicator: How do you measure the change?	**8. Quantity: How much change?**	**9. Duration: How long does it last?**	**10. Financial proxy: What would you use to value the change?**	**11. Value of change ($)**	**Dead-weight**	**Attribut-ion**	**Drop-off**	**Impact**
Amount and type of new investments	Unknown	Unknown	Monetary and other benefits of investments	Unknown				
Number of young people <40 years old in the village (% difference from years before the intervention)	Unknown	Unknown	Social cost of migration (unknown)	Unknown				
Amount of new disputes or older disputes that are revived	Unknown	Unknown	Days needed to settle disputes in terms of daily wages lost	Unknown				

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Annex 3.… Continued

Stakeholders	Intended/ unintended changes	Inputs		Outputs	Outcome
1. Who will be affected? Who will produce the effect?	**2. What will change for the stakeholders?**	**3. What is invested?**	**4. Monetary value**	**5. Summary of activity in numbers**	**6. How would you describe the change?**
District agencies[f]	Rural economic well-being and adaptive capacity is enhanced Deforestation is reduced Conflicts are aggravated	Extension services and capacity building (time and resources) for rubber agroforestry and marketing	(i) Wages of staff and (ii) price of any resources (e.g. seedlings if supplied by government[g])	Number of households or villages that have completed the training and capacity building, and that have adopted rubber agroforestry	Less need for economic aid, especially post-disaster, as supplied from district government. Forested areas are not cleared for new fields; forested areas are not 'sold' to concessions. More disputes filed (or re-filed) for settlement.

f District stakeholder perspectives related to the implementation of the intervention in other villages.

g In this case, the cost of seedlings should be removed from the costs incurred by farmers.

Outcome					Adjusting impact: "What else contributed to the change?"			
7. Indicator: How do you measure the change?	**8. Quantity: How much change?**	**9. Duration: How long does it last?**	**10. Financial proxy: What would you use to value the change?**	**11. Value of change ($)**	**Dead-weight**	**Attribut-ion**	**Drop-off**	**Impact**
% savings from economic aid/ assistance	Unknown	Unknown	Value of savings from economic aid/assistance	Unknown				
% of conserved forest that was previously under risk	Unknown	Unknown	Cost of forest patrolling, management and monitoring that would have been needed to protect areas at risk (or environmental and social cost of deforestation — more difficult to calculate)	Unknown				
Number of new disputes or older disputes revived	Unknown	Unknown	Days needed to settle disputes in terms of staff costs and resources	Unknown				

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Annex 3.… Continued

Stakeholders	Intended/unintended changes	Inputs		Outputs	Outcome
1. Who will be affected? Who will produce the effect?	**2. What will change for the stakeholders?**	**3. What is invested?**	**4. Monetary value**	**5. Summary of activity in numbers**	**6. How would you describe the change?**
Rubber buyers	Increase in the rubber available for purchase in the district	N/A	N/A	N/A	A more stable supply of rubber for marketing and export is available in the district
Neighboring villages	Conflicts with Setulang and other villages are aggravated	N/A	N/A	N/A	More disputes filed (or re-filed) for settlement

Outcome					Adjusting impact: "What else contributed to the change?"			
7. Indicator: How do you measure the change?	**8. Quantity: How much change?**	**9. Duration: How long does it last?**	**10. Financial proxy: What would you use to value the change?**	**11. Value of change ($)**	**Dead-weight**	**Attribut-ion**	**Drop-off**	**Impact**
% increase in rubber purchased from the district	Unknown	After year 8 until unknown	% increase in profits for buyer attributed to Malinau rubber; reduction in transportation costs if rubber had to be purchased from more distant places in the absence of the intervention	Unknown				
Number of new disputes or older disputes that are revived	Unknown	Unknown	Days needed to settle disputes in terms of daily wages lost	Unknown				

REDD+ interventions can help both people and forests adapt to climate change by conserving or enhancing biodiversity and forest ecosystem services. However, additional adaptation measures might be needed, such as the protection of agriculture and livelihoods and the development of fire management strategies. Such measures could support the sustainability of REDD+ interventions and the permanence of carbon stocks by preventing activity displacement and induced deforestation and by limiting or avoiding damage to livelihoods and ecosystems from extreme weather events.

This guidebook demonstrates how community-based adaptation (CBA) can be integrated into REDD+ interventions and other mitigation activities through a 5-step approach. In addition to vulnerability analysis, a combination of participatory and analytical methods is proposed to capture the voices of multiple stakeholders at the community and broader levels and examine the linkages between adaptation interventions and REDD+. Special emphasis is placed on forest resources and forest management to explore the potential costs and benefits of adaptation interventions for effective REDD+ implementation. Case-studies from Indonesia and the Philippines demonstrate how the steps can be followed.

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